## Appendix B

# PROTECTION—INDIVIDUAL AND COLLECTIVE

## 1. Individual Protection

Military individual protective equipment is designed to protect personnel from NBC agents in a combat environment but provide limited protection from hazards other than NBC weapons. Civilian response personnel use the Occupational Safety and Health Administration (OSHA) guidelines and National Institute for Occupational Safety and Health (NIOSH) and EPA designated levels of chemical protection (see paragraph 1 b). Familiarity with the OSHA/EPA information on these approved levels of personal protection will enable DOD personnel to understand and adapt to the protection and decontamination procedures used at an incident site. DOD personnel tasked to work in contaminated areas should be trained and equipped to the appropriate level of protection needed for the hazard present. The level of personal protection to be used at an incident site will be decided by the incident commander and will be coordinated with all responders and communicated through appropriate command channels.

a. Individual Protective Equipment.

(1) Proper selection and wearing of approved personal protective equipment (PPE) can provide the required respiratory protection. This is achieved by air filtration devices, such as the M40 or MCU2A/P protective mask, or by atmosphere supplying respiratory equipment, such as the SCBA. The air-filtration masks (AFM) should never be worn in the presence of unidentified and known contaminants that the filters are not designed for (e.g., a C2 canister is not a defense against carbon monoxide or ammonia) or in atmospheres containing less than 19.5 percent oxygen. This limits the use of these devices in some emergency-response operations. Atmosphere-supplying respiratory equipment, such as the SCBA and the supplied-air respirators (SAR), provide the responder with a source of air that creates a positive pressure in the facepiece. These respirators permit the responder to operate in low-oxygen and volatile chemical atmospheres where an air-purifying respirator (APR) does not offer enough protection. The SCBA is most commonly used in emergency operations and the SAR is used when extended work times are required. These devices will provide the responder with the greatest protection against exposures to gases and vapors.

(2) Proper personal protective clothing and equipment are needed for responders to complete their mission in a hazardous environment. The hazards present and the type of work to be done in the designated hot zone will dictate the type of PPE required. Furthermore, standardized donning and doffing procedures are required for responders that enter and exit the hot zone to—

- Minimize the spread of contamination.
- Ensure their safety.

- Establish a consistent and effective training program.

b. Levels of Individual Protection. There are four levels of protection established by the EPA (Levels A, B, C, and D). OSHA has also adopted these same four levels. The levels are determined by the skin and respiratory protection provided by the selected chemical protective ensemble. The protective suits are worn according to the guidelines published by OSHA and the National Fire Protection Association (NFPA). The PPE places an increased level of mental and physiological stress on individuals (i.e., heat stress, respiratory resistance, etc.), which must be carefully monitored and evaluated through all phases of an operation.

(1) Level A protection suits provide the greatest level of skin and respiratory protection (see Figure B-1). Level A consists of a totally encapsulating suit with gloves and boots attached. The SCBA is worn inside the suit or a supplied-air system will be used for respiratory protection. Two pairs of gloves, latex then chemical resistant, are worn under the suit gloves. Chemical-resistant boots are worn over the suit boots. A radio is worn, and optional items such as hard hats, cooling vests, and kneepads may be worn under the suit. This ensemble should be worn when the highest level of respiratory, skin, and eye protection are required.


**Figure B-1. Level A Protection**

(2) Level B protection should be considered when the highest level of respiratory protection is needed but with a lesser level of skin and eye protection. This level consists of nonencapsulating, chemical-resistant suits, often called splash suits or rain suits. Level B comes in several configurations, none of which are vapor tight (see Figure B-2). The SCBA is worn either inside or outside the suit depending on the configuration. Chemical-resistant outer boots are worn and three pairs of gloves may be used. Latex inner gloves are covered with chemical-resistant gloves, and then a pair of chemical-resistant outer gloves may cover both of these for additional protection. A radio is worn, and the optional items listed for Level A may also be worn. Level B is the minimum level recommended for initial site entry until all hazards have been identified and are being monitored.

**Figure B-2. Level B Protection**

(3) Level C protection can be selected when the airborne substance is known and is being monitored. All criteria must be met and the proper filters for the known hazard must be available when using the APR. The air must be continuously monitored throughout the operation to ensure that the Level C protection remains effective for the environment (see Figure B-3). An escape mask should be worn in case of a change in conditions that make the air-purifying mask ineffective. This escape mask will provide protection to the responder during movement to the decontamination line without risking exposure. The Level C ensemble consists of a full facepiece, the APR, and a chemical-agent-resistant suit. Chemical-agent-resistant hood, apron, boots, and gloves should also be worn. The gloves are layered the same as for Level B. A radio is worn, and the optional items for Level A may be worn under the suit. Level C protection is similar to MOPP4 in a chemical-weapons environment; MOPP suits and protective masks are not effective for many TIC. The levels of protection set by the incident commander must be followed to protect all personnel.

**Figure B-3. Level C Protection**

(4) Level D protection does not provide any respiratory or skin protection and should not be used at an incident site that presents these hazards (see Figure B-4). The protective ensemble for Level D is a work uniform. The military battle-dress uniform or coveralls meet the requirements for this level of protection.

**Figure B-4. Level D Protection**

## 2. Shelter/Protection In Place

Field-expedient protection includes steps taken to provide immediate protection of personnel/materiel and to enhance protection of mission-essential facilities in the event of an incident. These procedures and planning factors are often included in emergency-action discussions of "protection in place" when it is required to sustain critical operations through an event or key infrastructure facilities that may be a target. The following discussion focuses on four basic concepts.

a. Sealing Air-Infiltration Points. Ideally, sealing the inside of a building/room should be done before the attack or incident. Particular care must be taken to ensure that all openings to the outside that can possibly be sealed are ready for immediate sealing at first warning.

(1) Precut and position sealing materials for doors so that final sealing requires minimum response time. Once an attack occurs, sealed doors are no longer usable and the door should be labeled as being sealed. Based on weather, preseal windows and other openings. Seal all air conditioning (AC) and heating vents and ducts leading to the inside/outside. Materials should be precut and positioned, ready for use.

(2) Some openings lend themselves to sealing or packaging material generically referred to as "foam-in-place" packaging systems available through local procurement. Foam-in-place is a generic term for a commercially available packaging/sealing material that expands when sprayed onto a surface or into an enclosed area.

**CAUTION: Since air circulation and ventilation are restricted using these techniques, execution relies on early warning and rapid action to complete sealing.**

b. Using NBC or Expedient Covers. Keep supplies indoors, if possible. Always keep the supplies covered whether stored indoors or outdoors. Uncover supplies only long enough to retrieve needed items. When practicable, cover all equipment. When not in use, park equipment under overhead cover. If insufficient NBC or expedient covers are available for the amount of equipment/supplies to be covered, prioritize by need and equipment/supply availability to determine which supplies and equipment will be covered.

c. Using NBC or Expedient Shelters. Designate and prepare shelters before an attack/incident and routinely use them during exercises. These shelters may include approved NBC or expedient shelters.

d. Using Multilevel Buildings (Vertical Separation). Chemical agents tend to be heavier than air (selected blood agents are excluded). When preparing alternate $C^2$ and medical facilities, use floors above ground level to avoid the full impact of chemical agents. Prepare and use the sealing techniques previously discussed.

**NOTE: These procedures are offered primarily for hard-to-protect facilities and unprotected HN facilities/residences. DOD agencies should strive to provide approved NBC collective protection at designated critical facilities.**

## 3. Summary

Train all personnel on where, when, and how to protect themselves, equipment, and supplies under NBC conditions. Follow up with exercises and drills to reinforce and sustain training proficiency. Postattack actions should also be addressed during attack/incident exercises. Establish and maintain protective postures for required civilians, as well as military forces. Establish and maintain protective-equipment serviceability programs according to the specific items' technical references. Table B-1 is designed to assist the commander in providing protection-in-place options.

**Table B-1. Protection-In-Place Options**

| For This Function: | Use These Items: | With This Guidance |
|---|---|---|
| **Sealing Air-infiltration Points** | • Plastic Canvas<br>• Plastic Sheeting<br>• NBC-Protective Cover (NBC-PC)<br>• Foam In Place<br>• Gasket forming materials (silicon, rubber gaskets, foam-sealing materials) | • Place plastic around the inside of windows and doors.<br>• Close holes and windows with plywood; seal them using the items shown and duct tape.<br>• Spray foam into doorways, ducts, and windows, overlapping all sills and openings. Foam spray will not work well on overhead horizontal surfaces.<br>• Spray foam into all air intakes and exhausts.<br>• Cut and fit plastic as necessary; use duct tape to hold it in place.<br>• **CAUTION: Turn off heat, ventilation, and AC systems before sealing air intakes/exhausts.** |
| **Using NBC or Expedient Covers**<br>Individual Covers | • Plastic Sheet<br>• Plastic Canvas<br>• NBC-PC<br>• Military/Civilian Wet-Weather Gear/Rain Suits (Rubber)<br>• Ponchos<br>• Modular Chemically Hardened Tent (MCHT)<br>• Tent Extendible Modular, Personnel (TEMPER) | • Cut plastic sheet, plastic canvas, and NBC-PC 1.5 times taller and wider than the individual using it. Use it as a cover to provide protection in place for personnel caught in the open.<br>• Make rain suits/ponchos part of the daily work uniform; use them in conjunction with plastic sheet, plastic canvas, and NBC-PC |
| Material Covers | • Plastic Sheeting<br>• Plastic-Coated Canvas<br>• NBC-PC<br>• Large-Area Shade Systems<br>• Large-Area Maintenance Shelter | • Cut and fit plastic as necessary; use duct tape to hold it in place.<br>• Place covered material under shade systems or shelter for additional protection. |

**Table B-1. Protection-In-Place Options (Continued)**

| For This Function: | Use These Items: | With This Guidance |
|---|---|---|
| **Using NBC or Expedient Shelters** | • Container Express (CONEX)<br>• Military-Owned Demountable Container (MILVAN)<br>• Modular Command-Post System (MCPS)<br>• Modular General-Purpose Tent System (MGPTS) | • Place the CONEX/MILVAN at regular intervals around fixed sites. Attach plastic sheet/NBC-PC of sufficient size to the front of the CONEX/MILVAN to cover the opening and to act as a liquid barrier. Attach weight (piece of wood/iron bar, etc) to the bottom edge of the plastic to hold it in place when it is being used.<br>• Erect an MCPS/MGPTS at specified intervals (based on personnel concentrations).<br>• Use these measures in conjunction with individual and material covers. |
| **Using Multilevel Building (Vertical Separation)** | • Plastic Sheeting<br>• Plastic-Coated Canvas<br>• NBC-PC | • Move operations to upper floors/levels.<br>• Block entryways and openings with multiple sheets of plastic. Place a plastic sheet at the foot of the stairs, another part way up the stairs, a third at the top of the stairs, etc. |
| **CAUTION: The duration of protection when using these measures is not quantified and is provided for emergency situations only. This table does not preclude using other expedient measures afforded by available materials and common sense.** | | |

## 4. Expedient Actions

The following expedient actions can greatly enhance the protective capabilities of a medical-treatment facility:

a. Seal all windows, doors, and other outside openings with tape and plastic sheeting.

b. Turn off the AC/heaters and set up an air lock-type entry/exit way.

c. Activate air handlers if they are available to provide a positive facility overpressure. This will further reduce the incidence of contamination entering the facility.

d. Use these procedures to allow additional time for hospital personnel to provide patients with some degree of individual protection for staying in place or for transport away from the contaminated area.